EXHIBIT "A"

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of: William L. Betts	
Serial No.: 09/766,255	Group Art Unit: 2637
Filed: January 17, 2001	Examiner: David B. Lugo
For: Tone Ordered Discrete Multitone Interleaver	Docket No.: 061607-1361

AFFIDAVIT OF KENNETH D. KO
UNDER 37 C.F.R. 1.132

Commissioner for Patents
Alexandria, VA 22313-1450

Sir:

I, Kenneth D. Ko, declare as follows:

Education and Experience

1. I am an employee of the assignee of the 09/716,787 application.

2. I graduated from the Georgia Institute of Technology with a B.S.E.E. (Bachelor of Science in Electrical Engineering) degree in 1980, and from the University of South Florida with an M.S. degree in Electrical Engineering (with emphasis in Digital Signal Processing and Communications) in 1987.

3. I am an inventor or co-inventor on 29 U.S. patents.

4. I have participated in international, regional, and national standards committees, including the ITU (International Telecommunications Union), ETSI (European Telecommunications Standards Institute), TIA (Telecommunications Industry Association),

ATIS (Alliance for Telecommunications Industry Solutions), DSL Task Group (United Kingdom), TTC (Telecommunication Technology Committee, Japan), and DSL Forum since 1994.

5. I have worked for 17 years on systems which use digital modulation, including multi-carrier modulation. These systems include digital subscriber loop (DSL) modems and voice frequency modems for both dial and leased lines.

6. Through my education and work in the telecommunications industry, I have become very familiar with a number of standards related to DSL, including G.992.1, G.992.2, and T.413.

Exemplary Claim 34

7. Exemplary claim 34 recites "a tone ordering element configured to assign bits to at least a portion of the tones in an interleaved manner such that adjacent tones have different bit densities."

The Helms Reference (U.S. 6,144,695, herein Helms)

8. *Helms* discloses a tone ordering element configured to assign bits to tones. *Helms* does not disclose that the result of the bit assignment is that "adjacent tones have different bit densities."

The Tzannes Reference (U.S. 6,498,808, herein Tzannes)

9. The Examiner alleges that *Tzannes* discloses a bit allocation table (BAT), Table 1, "illustrating that each of a series of tones is associated with a bit density, and the number of bits assigned to each tone is different from the number of bits assigned to the adjacent tones."

Examiner's Rejection of Claim 34 under the Combination of Tzannes and Helms

10. Based on the teaching of *Helms* as stated in paragraph 7 above, and the alleged teaching of *Tzannes* as stated in paragraph 8 above, the Examiner concludes that "when the tone interleaving of Helms is used in the system of Tzannes, the bits assigned to the tones will maintain the property of having adjacent tones with different bit densities." (Office Action Paper No. 20050601, p. 2.)

The Tzannes-Helms Combination as Understood by a Person of Ordinary Skill in the art

11. As a person of ordinary skill in the art of multicarrier modulation, I disagree with the Examiner's conclusion for at least the following reasons.

12. The Examiner's rejection relies on Table 1 in *Tzannes*, which is found in the Background section. This section describes a G.992.1 transmitter. Therefore, the teachings of *Tzannes* are to be understood in light of the G.992.1 specification.

13. A G.992.1 transmitter uses two different Bit Allocation Tables. Table R-B&G (G.992.1, Section 10.9.14) is received from the remote modem, and is ordered by tone. Table b'_i (G.992.1, Section 7.7) is based on the R-B&G but is ordered by bit density.

14. As a person of ordinary skill in the art of multicarrier modulation viewing *Tzannes* in light of the G.992.1 specification, I recognize Table 1 to be an example R-B&G. I attach no significance to the fact that adjacent tones in Table 1 have different bit densities, and consider this to be only a coincidence, since G.992.1 does not assign bits to tones "such that adjacent tones have different bit densities."

15. As a person of ordinary skill in the art, I understand the combination of "the tone interleaving of *Helms*" and the "system of *Tzannes*" to be nothing more than conventional tone interleaving of G.992.1.

Differences between Interleaving of Claimed Invention to G.992.1 Iinterleaver

16. One advantage of the tone interleaving claimed in the current application is reduction of noise correlation in adjacent trellis symbols, accomplished by spreading trellis symbols across tones. (Application, p. 4, lines 15-22.) In order for this advantage to be realized, the relationship of the tone interleaver to the trellis encoder must be maintained.

17. The trellis encoder of G.992.1 operates on tones ordered per the sequence b'_i (section 7.8.1), in which bit density is non-decreasing across tones. In the general case, this ordering is not the same as the indexed ordering found in Table R-B&G. However, if some number of adjacent tones in Table R-B&G have the same bit density, as is generally the case in prior art, these tones will also be adjacent in sequence b'i.

18. In order for the trellis symbols to be interleaved, the ordering of sequence b'_i must be interleaved relative to the ordering in Table R-B&G. This is accomplished by interleaving the bit densities in Table R-B&G such that the tone ordering element performs the interleaving. The interleaver 325 referenced in *Helms* has no effect on either the bit densities in Table R-B&G or on the tone ordering.

19. Thus, it is not possible to interleave tones such that adjacent tones have different bit densities, using the interleaver 325 referenced in *Helms*. This is true whether or not it is used in the system of *Tzannes*.

Tone Ordering According to G.992.1

20. The portions of *Helms* and *Tzannes* on which the Examiner relies teach the conventional tone ordering of G.992.1. Therefore, the combination also teaches tone ordering according to G.992.1.

21. G.992.1 teaches a tone ordering element in which the assignment of bits to tones is reordered, from an original tone-ordered seqeuence to a sequence of non-decreasing bit density. (Section 7.7.) Figure 7-11 shows both the original sequence and the result. In the original sequence, bits are assigned to tones as follows: 2 bits to t_0; 3 bits to t_1; 6 bits to t_2; 3 bits to t_3; 2 bits to t_4; 0 bits to t_5. In the reordered sequence, bits are assigned as follows: 2 bits to t_0; 2 bits to t_4; 3 bits to t_1; 3 bits to t_3; 6 bits to t_2; Thus, the bit density is non-decreasing: 2, 2, 3, 3, 6.

22. Assuming that this reordering is considered to be interleaving, then G.992.1 discloses "a tone ordering element configured to assign bits to at least a portion of the tones in an interleaved manner such that bit density is non-decreasing across tones."

23. The tone ordering of G.992.1 allows adjacent tones to have the same bit density (See Figure 7-11). This teaches away from claimed invention, e.g., claim 34 recites bits are assigned to tones "in an interleaved manner such that adjacent tones have different bit densities."

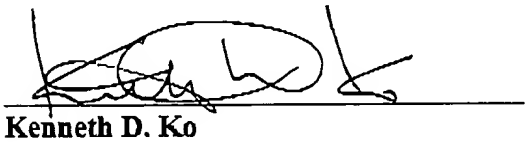
Differences between Tone Ordering of Claimed Invention and Tone Ordering of G.992.1

24. In both the claimed invention and G.992.1, two tones which are assigned the same bit density are trellis-coded consecutively. G.992.1 allows tones assigned the same bit density to be adjacent in frequency. When this occurs, these frequency-adjacent tones are trellis-coded consecutively, and noise that affects frequency-adjacent tones affects consecutive trellis symbols.

25. In contrast, the claimed invention does not allow two tones which are adjacent in frequency to have the same bit density. Two tones with the same bit density will be trellis-coded consecutively – but these consecutively-coded tones are never adjacent in frequency. And unlike G.992.1, in the claimed invention two tones which are adjacent in frequency will be assigned different bit densities, and will therefore be fed to the trellis coder non-consecutively. Noise that affects frequency-adjacent tones will be spread across multiple trellis symbols.

DECLARATION

I hereby declare that all statements made herein are of my own knowledge are true and that all statements are made on information and belief and are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



Kenneth D. Ko

9.1.2005

Date